

show that this is very doubtful. On July 10 three ripe females were taken from the tank, in which the temperature during the previous week fluctuated between 18.5° and 19.5°C., and placed in an aquarium filled with filtered sea water. The temperature was kept at 22.6°C. but occasionally rose to 23.4°C. The shell movement of each oyster was recorded on the kymograph. The first oyster was kept for 5 hours 22 minutes, the second for 29 hours 53 minutes, and the third one for 73 hours 13 minutes. The water in the tanks in which the second and third oysters were kept was changed twice a day. None of the oysters spawned during that time but each of them spawned after sperm was added to the water the latent periods being 16, 24 and 15 minutes respectively.

TABLE 1.—SPAWNING REACTIONS OF THE FEMALES OF *O. VIRGINICA* INDUCED BY TEMPERATURE

Date in 1931	Experiment No.	Temperature °C.		Latent period in minutes	Duration of spawning in minutes
		Before experiment	During experiment		
July 10	325	19.5	24.5	65	43
9	321	19.9	25.0	22	118
7	317	19.9	25.3	250	46
9	322	19.9	26.0	257	38
8	318	19.9	28.0	32	25
8	319	19.9	28.5	55	44
17	340	20.4	30.0	20	?
8	320	19.9	30.0	42	52

It is interesting to note that in both cases of stimulation either by the temperature or by the sperm the reaction is alike and is characterized by a series of rhythmical contractions of the adductor muscle and of the mantle. From that an inference can be made that both factors release some mechanism in the organism of the female which in turn stimulates the adductor muscle and causes the discharge of eggs from the ovary. In this respect the reaction is not specific. It is, however, specific in the sense that sperm of other mollusks (*Mya* spp., *Mytilus* spp.) fail to induce spawning of the oyster. No positive results were obtained also when the sperm of *O. cucullata* was added to the female of *O. virginica* and vice versa. The last experiments are not conclusive, however, because of the failure of the specimens used in the experiments to spawn immediately upon the addition of the sperm of the same species. A few days later the shedding of eggs was successfully

stimulated by adding sperm of the same species. Attempts to fertilize eggs of *O. cucullata* by sperm of *O. virginica* and *vice versa* were unsuccessful. There was no formation of the fertilization membrane and no cleavage, whereas in the controls the eggs developed fairly well.

The spawning reaction of the male consists in a discharge of sperm which is carried away by the stream of water produced by the gill epithelium. The reaction is much simpler than it is in the female; it does not involve the adductor muscle and therefore can not be recorded on a kymograph. The males respond to the increase in temperature more readily than the females and often spawn in the tanks when the temperature reaches 24°C. Similar to the spawning of the females the shedding of sperm can be easily provoked by the addition of a few drops of egg suspension or egg water. Unlike the female in which the latent period lasts for several minutes the latent period of the spawning reaction of the male is of brief duration. It lasts only a few seconds. The reaction can be repeated many times until the male is spent. In case of *O. gigas* the males respond to egg suspension even when the water has been cooled to 12.5°C.

In 1930 several experiments with the two species of oysters, *O. virginica* and *O. cucullata*, were performed at Honolulu. The males failed to respond to the addition of sperm of another species but immediately reacted by discharging sperm to the addition of eggs of the same species. These results indicate very clearly the specificity of the response of the male to the presence of eggs. It would be very interesting to extend these experiments to other species of oysters the taxonomic characters of which, as for example those of *O. virginica* and *O. angulata*, are rather indistinct. There is no doubt that physiological differences that might be found would help in determining the validity of the present definitions of various species of the genus *Ostrea*.

Besides being stimulated by the temperature and egg suspension the males of *O. virginica* can be stimulated also by sperm. In that case the latent period of the reaction is approximately of the same duration as it is in the case of the stimulation of the female. A probable explanation is that the active principle of sperm suspension, being insoluble in the sea water, acts upon the organism through the digestive tract.

From a biological point of view stimulation of spawning either by the temperature or by the sperm and egg suspension is of great interest. It provides a mechanism which insures successful propagation of the